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International Center for Public Policy
Working Paper 17- 18
October 2017

The Effects of Presumptive Methods of Taxation on Revenue Mobilization in the Value Added Tax

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The Effects of Presumptive Methods of Taxation on Revenue Mobilization in the Value Added Tax[1]

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Abstract

Recent economic studies of presumptive taxation in the ECA region suggest negative effects of these tax modes on tax revenues mobilization. This study uses a three-stage methodology to estimate the effect of presumptive taxation on revenue mobilization for the VAT. First, we develop a new approach to estimate the true VAT potential tax base in an economy that includes presumptive taxation. Next, the paper assesses potential tax collections reflecting true taxable capacity and a tax effort index, suggesting the presence of inefficiencies in the tax system and sizable tax avoidance. Second, we use regression analysis to test for the scale of impact of presumptive taxation on VAT collections. Third, we use vector autoregression analysis (VAR) to analyze the bidirectional effect of VAT actual and potential collection and presumptive taxation modes in short and long-term perspective. For contrasting the variance of impact of presumptive taxation on VAT mobilization we use two different presumptive tax modes, simplified tax and presumptive payments, with different tax structures. We use data for Armenia for the numerical application of the analysis. Our findings reveal that, indeed, Armenia's simplified tax has a significant distorting and diminishing effect on VAT collections. Meanwhile, presumptive payments have a positive impact on VAT mobilization.

Keywords: Value-added tax (VAT); presumptive taxes; tax avoidance; taxable capacity; tax effort index; simplified tax; SMEs; vector autoregression function; Granger causality test

JEL Classification: H2, H21, H26, H3

[1] The author is indebted to Andrew Feltenstein and Jorge Martinez-Vazquez for many helpful suggestions and comments.

I. INTRODUCTION

The focus of this paper is to study the effect of presumptive taxation mechanisms on tax revenues collection, when governments attempt to promote small and medium enterprises (SMEs) or to tax those industries, where the general application of the regular tax base calculation is inefficient[2]. Other times, in fact, governments may implement presumptive taxation mechanisms seeking to increase tax revenue inflows.

This study is conducted using data from Armenia covering the period from 1997 to 2015, employing a three-stage methodology to analyze the impact on revenue mobilization of presumptive taxes that include presumptive payments and simplified tax modes.

The choice of Armenia as a case study for deriving empirical results is straightforward. This country has a comparatively simple fiscal system associated with all three tax modes. The discussion on the main differences among the general tax mode and two other presumptive methods is presented in Appendix 1. As it described, from the tax accounting standpoint VAT plays the most essential role in each of the three tax modes and it ensures the largest stream of government revenues (Tables 1 and 2). Thus, the ratio of collected VAT-to GDP is in the range of $4.64 - 9.12\ percent$. The revenues from presumptive taxes are quite insignificant and the ratio for combined presumptive taxes-to-GDP is in the range of $0.3 - 0.99\ percent$ (Table 3). Both presumptive taxes also have lower effective tax rates, and are simpler to comply with internal tax accounting and tax filing to authorities.

The methodology of the study estimates the "true" tax base associated with potential VAT revenue collections. To reveal the potential negative effect of presumptive taxes on VAT revenues, we proceed with two different econometric tools. We use Ordinary Least Square

[2] The general development of economic thought addressing presumptive taxation is discussed in the Literature Review section. Appendix 1 provides details on two specific presumptive taxation modes used in this study.

(OLS) to analyze the effect of ratios of collected VAT, simplified tax and presumptive payments on VAT taxable capacity (TC) and a tax effort index (TEI). Further, the vector autoregression function (VAR) is applied to all five indicators of actual and potential tax collection performance in VAT and presumptive taxes in order to reveal additional information on short and long-term bidirectional causalities associated with these indicators.

The study contributes to the literature in several ways. First, it offers a new methodology for the potential VAT calculation or estimation of the true VAT capacity. Second, it estimates whether tax simplification policies in Armenia (and potentially in other countries) support higher tax revenue collections or actually result in lower revenues. In fact, the study finds that presumptive taxes can have an adverse effect on actual and potential VAT collections. Third, we nevertheless find that presumptive payments applied to the enterprises, where the tax base calculation is based on the business specific indicators, can have a positive effect on tax revenues. On the other hand, the simplified tax, which has a similar tax base to the VAT but it actually works as a business turnover for the reported period, has a very significant distorting effect and can become a tool for tax avoidance.

The rest of the paper is organized as follows. Section 2 offers the literature review. Section 3 estimates the "true" tax base associated with potential VAT revenue collection and applies it to assess the "true" taxable capacity and tax effort index in VAT. Section 4 introduces two multiple regressions using the Ordinary Least Square to test a hypothesis whether presumptive taxes have a significant effect on VAT collection, using the newly assessed VAT taxable capacity and tax effort index as dependent variables. Section 5 applies vector autoregression (VAR) tools to analyze the interactions of all five actual and potential tax collection measurements in short and long-term perspectives. Section 6 concludes the study.

II. LITERATURE REVIEW

Many past studies have addressed issues affecting effective tax mobilization. More recent reports suggest that it would be hard to secure sustainable economic growth in a country, where the tax-to-GDP ratio is below 15 percent. As some of the challenges in developing countries the economists cite the structure of economy, which creates additional difficulties for effective tax collection, limited capacity of the tax administration, data scarcity or poor quality of data and political set up being less amenable to rational tax policies than in advanced countries. In economies, where public feels recognized and their interests being properly represented, taxpayers are willing to contribute more in form of taxes, than in the societies, where people feel neglected and underrepresented, farther causing tax avoidance. Also the environment of competition and budgetary constraints, where firms cannot manipulate production expenditures, drives them into underground operations in response to tax increases leading to serious macroeconomic disruptions in the form of reduced tax base and lower tax revenues (Tanzi and Zee, 2000; Dabla-Norris and Feltenstein, 2005; Bird, Martinez-Vazquez and Torgler, 2014; World Bank, 2015).

The studies addressing countries of ECA region identify some of the issues of tax mobilization associated with the counter effect of presumptive taxes. Thus, in Georgia, Kazakhstan and Kyrgyz Republic the lower tax rates and simplified reporting of simplified tax applied to SMEs, instead of stimulating these businesses to grow larger and bringing them to the formal sector of general taxation, in long-term cause these companies to use techniques such as bribery, business subdivision, etc. to reduce turnover and continue being taxed as SMEs. In Armenia a study reveals large discrepancies in levied tax burden for the firms operating in the general tax mode and presumptive taxes. The discrepancy in tax burden combined with the

simpler tax accounting and tax filing routines in both presumptive taxes could incentivize tax avoidance (Sedrakyan, 2007; World Bank, 2011).

Thuronyi (1996) discusses the main situations when presumptive techniques of tax administration could be useful and he addresses six general conditions. Some of those conditions are as follows: simplification of compliance burden for taxpayers with low turnover; provision of objective indicators for tax assessment, where presumptive methods may lead to a more realistic distribution of the tax burden; rebuttable presumption to encourage taxpayers to maintain proper accounting; minimum taxes to stimulate higher revenue inflow, etc. This paper addresses the effect of the first two stipulations of presumptive techniques: the simplification of compliance burden and the provision of more realistic tax assessment indicators[3].

Economic literature addressing the importance of more thorough assessment of the principals and mechanisms of presumptive taxation summarizes that although this tax mechanisms had been widely used by industrial and developing countries for tax administration purposes; however, the public finance literature failed to provide comprehensive studies of the specifics for effective design and implementation of presumptive mechanisms. While earlier studies of presumptive taxation viewed it as an alternative/companion mechanism to income tax, more recent papers on presumptive taxation view it in a broader spectrum, which can be an alternative to both income tax and VAT, especially while considering tax systems in ECA region. Additionally, the public economists note the scarcity of the research on the use of presumptive taxation modes and control of consequent corruption (Casanegra de Jantscher and Tanzi (1987); Faulk, Martinez-Vazquez and Wallace (2006); Engelschalk and Loeprick, 2015).

[3] The Government of Armenia denotes simplified tax as the tax associated with the simplification of compliance burden and presumptive payments as the tax associated with the utilization of business specific indicators. The paper follows the same notation.

In the public economics literature some of the most common studied determinants for effective tax system are tax effort index and taxable capacity. In general, the higher actual tax mobilization corresponds with a higher volume of estimated tax effort, which also shows that a particular country better utilizes the fiscal and tax administration mechanisms in a given economy. In the literature the terms tax effort and tax effort index are used interchangeably. The more common approach is to use tax effort in reference to the actual tax-to GDP ratio, taxable capacity as the predicted tax-to-GDP ratio and tax effort index as ratio of tax effort to taxable capacity (Bahl, 1971; Piancastelli, 2001; Le, et al. 2012; Feltenstein et al., 2017).

The studies of panel data sets considering the effect of different exogenous factors on the tax effort and taxable capacity measurements in pre-selected groups of countries suggest that Armenia is a low tax collection and low tax effort country. Thus, some of the ratios determined by these studies are in the following ranges: collected tax-to GDP from 16.18 to 17.92, taxable capacity from 17.1 to 23.61 and tax effort index from 0.71 to 0.84 (Davoodi and Grigorian, 2007; Le, Moreno-Dodson and Bayraktar, 2012; Cyan, Martinez-Vazquez and Vulovic, 2013; Bird, et al., 2014; Khwaja and Iyer, 2014).

The growing importance of value-added tax (VAT) has been a focal point of many studies. Almost 70 percent of the world's population lives in countries with VAT and this tax raises roughly one fourth of all government revenues. The VAT performance is viewed as a measurement, which can be impacted by "policy gap" and "compliance gap". The specific design of a policy may reduce the amount of legally available VAT revenue, while the administrative weaknesses and constrains may lead to uncollected tax revenues. Similar studies of the effect of the VAT regulations and administration on tax revenue mobilization were also applied to the case of Armenia (Ebrill et al, 2001; Sedrakyan, 2006; OECD, 2015).

III. ESTIMATING POTENTIAL VAT BASE IN AN ECONOMY WITH ALTERNATIVE SIMPLIFIED OR PRESUMPTIVE TAXES

3.1. Methodology

In this section, we develop a methodology that allows a comprehensive estimation of the value-added tax base and potential revenue from VAT in a fiscal environment with two presumptive tax modes, simplified tax or presumptive payments, and taking into consideration the country's production of national income and tax institutions. A discussion on three different approaches to GDP calculation can be found at McCulla and Smith (2015). Here we use the value added approach of GDP estimation. Further, we use the derived data for potential tax revenue to estimate the taxable capacity and tax effort indexes.

We start with addressing the national accounts identity

$$GDP = C + I + G + NX$$

Net-export (NX) is a difference between export (EX) and import (IM) activities$NX = EX - IM$. Armenia is a net-importer, where $(IM - EX > 0)$. All export related activities are exempted with the 0% VAT rate and the exporters get refunded all VAT paid in the previous stages of production. In case of import of goods to the territory of Armenia the VAT is calculated at the moment of importing these products and a 20% VAT rate is applied. The formula for estimating the VAT revenue from foreign trade activities with 20% VAT rate is:

$$VAT_{NX} = (IM - EX) * 20\,\%$$

Further, the $C + I + G$ is the value added produced inside the country. Here we use the advantage of the value added approach to GDP calculation, where the value added produced in the economy in a given year in Armenia is calculated as $GDP - NT$, where NT is net taxes on production input (or taxes net of subsidies). Further, in order to promote specific industries or

sectors of economy the government may exempt some of those sectors from paying VAT. Thus, in Armenia- like in many other countries - the agricultural sector is mostly VAT exempt; therefore, the value added produced in the agricultural sector is deducted from the VAT base. After considering all these specifics of the national tax legislation the formula of the VAT base calculation can be written as follows:

$$VAT\ base_i = GDP_i - NT_i + NX_i - \sum S_{ni} \qquad (1)$$

where,

$VAT\ base_i$ VAT base in the period *i*

GDP_i Gross Domestic Product in the period *i*

NX_i *(IM - EX)* in the period *i*

S_{ni} Sector of economy *n* in the period *i* with VAT exempt or with 0% VAT rate

NT_i Net Taxes on production input (without subsidies) in the period *i*

Moreover, the tax legislation states there are other taxes that could also contain VAT as part of their tax structure or be established as presumptive tax modes to replace VAT, such as simplified tax and presumptive payments[4]. Additionally, in the case of Armenia the government introduced patent fees in 2010 and a turnover tax in 2012. The turnover tax is a replacement for simplified tax with similar regulation and taxation mechanisms, where the tax base is a business turnover for the reported period. The patent fees mainly address services provided by micro businesses with a single entrepreneur-taxpayer (no additional employees) and take characteristics of presumptive payments, where specific business related indicators are used to estimate the tax base (more on presumptive tax modes in Appendix 1). Therefore, if the VAT base estimated in the formula above is used for the potential VAT revenue estimation, it will include double

[4] Ministry of Finance of Republic of Armenia, (1997). The Republic of Armenia law about taxes. Ministry of Finance of Republic of Armenia, 04.14.1997, AL-107.

taxation and will overly exagerate the size of the tax base. The simplified tax and presumptive payments should also be addressed in the methodology of the estimates of potential VAT base. However, in practice it is challenging to determine, for instance, what part of the trade and public catering sector is subject to taxation in general tax regime and what part is a subject to simplified tax or presumptive payments (more on specifics of taxation of this sector in Figure 1). Therefore, in order to neutralize the potential VAT base from the aggregate VAT existent in presumptive tax modes, we deduct the portion of VAT that has been collected as part of these taxes.

Potential revenue from VAT from a given economy in a given year is estimated as:

$$potential\ VAT\ revenue_i = (VAT\ rate_i) * (VAT\ base_i) - \sum(\beta_{VATPT_{mi}} * PT_{mi}) \quad (2)$$

$VAT\ revenue_i$ Potential revenue from VAT in the period *i*

$VAT\ rate_i$ VAT rate in the period *i*

PT_{mi} Revenue from Presumptive Tax mode *m* in the period *i*

$\beta_{VATPT_{mi}}$ Recounting rate of VAT in the Presumptive Tax mode *m* in the period *i*

Thus, if applied to Armenia, as there are two defined presumptive tax modes, simplified tax and presumptive payments, the formula for the VAT estimate from the aggregate of presumptive tax modes, with consideration that the recounting rate of VAT for both taxes is 60%, can be rewritten as[5]:

$$\sum(\beta_{VATPT_{mi}} * PT_{mi}) = (Simplified\ tax_i) * 60\% + (Presumptive\ Payments_i) * 60\%$$

$$= 60\% * (Simplified\ tax_i + Presumptive\ Payments_i)$$

[5] Recounting rate is used for assessment of the share of VAT and corporate income tax in presumptive taxes, if the company moves from a presumptive to general tax regime during the fiscal year. In Armenia the recounting rate of VAT is 60% and corporate income tax is 40% in all presumptive taxes. Source: Ministry of Finance of Republic of Armenia. The RA Laws "On presumptive payments" and "On simplified tax".

From the equation (2) the gap in VAT collection is the difference of potential and collected VAT.

This methodology is further used to derive the taxable capacity (TC_i) and a tax effort index (TEI_i) for VAT. Thus, taxable capacity defines the ratio of tax collection to GDP that could have been achieved in the given economy with more sophisticated tax administration mechanisms and it is a ratio of potential VAT revenue to GDP for a given period (3):

$$TC_i = \frac{Potential\ VAT\ revenue_i}{GDP_i} \qquad (3)$$

VAT tax effort index is a ratio between VAT tax effort (TE_i) , which is calculated as ratio of collected VAT-to GDP, and VAT taxable capacity (TC_i) , which is calculated as ratio of potential VAT-to GDP for a given year (4).

$$TEI_i = \frac{TE_i}{TC_i} = \frac{\frac{Collected\ VAT_i}{\cancel{GDP_i}}}{\frac{Potential\ VAT\ revenue_i}{\cancel{GDP_i}}} = \frac{Collected\ VAT_i}{Potential\ VAT\ revenue_i} \qquad (4)$$

3.2. Results

The empirical results are presented in Table 4[6]. The estimates reveal that the potential VAT has been continuously growing in the period from 1997 to 2015. Until 2013 collected VAT had been lower than the VAT gap or uncollected VAT, which is calculated as a difference of potential VAT and collected VAT. However, during the whole studied period, for the first time in 2013, collected VAT exceeded the VAT gap estimate, which can be viewed as a somewhat positive trajectory for improvements in tax collection efforts (Table 4).

Another takeaway is that tax policies in Armenia support a higher potential for VAT collection; however, currently there is a large disparity in actual and potential estimates. This

[6] The tax estimate for the patent fees is not included in the calculation of the tax potential and tax gap, as the collected revenue from this tax has not been provided as a separate line of revenue in the annual state budget reports.

gives more opportunities for administration efforts to employ more advanced tax mobilization techniques.

Another interesting specific revealed in this section is the tax administration had been so inefficient that potential VAT revenue (taxable capacity) calculated by this methodology exceeds actual total tax revenue collection until 2012 (Table 5) as comparison of drawings for taxable capacity and tax revenue-to GDP. This result is supported and directly corresponds with the information provided by the World Bank country-report. The report summarizes the challenges of tax administration in Armenia, where some of the cited obstacles are low tax-to-GDP ratio for the country's level of income, resulting in a narrow tax base with numerous tax exemptions and a weak capacity to detect and penalize tax frauds. Both challenges undermine compliance and contribute to widespread tax evasion and informal sector activities (World Bank, 2017).

The results derived in this section are robust since the taxable capacity and tax effort index derived using the offered new methodology are very close to the estimates derived by other studies for the similar period. Thus, Le et al. (2012)'s estimates of taxable capacity and tax effort index for Armenia are 23.61 and 0.76, respectively. Cyan, Martinez-Vazquez and Vulovic estimated the tax effort index for Armenia as 0.71 and 0.73, based on variant methodologies. Khwaja and Iyer assessed the same indexes from the perspective of economic performance (taxable capacity 17.10 and tax effort 1.08) and legal framework (taxable capacity 21.96 and tax effort 0.84) (Le, et al., 2012; Cyan, et al., 2013; Khwaja and Iyer, 2014). Tables 4 and 5 present estimates derived in this study for the period from 1997 to 2015. Since in this analysis we derived the annual estimates of VAT taxable capacity and tax effort index, therefore the average estimates mentioned in the cited research papers above could provide guidance; however, they should not be equal.

IV. ANALYSIS OF THE UNIDIRECTIONAL EFFECT OF PRESUMPTIVE TAX MODES ON VAT COLLECTION INDICATORS

4.1. Methodology

This section examines whether imposition of presumptive tax modes, such as simplified tax and presumptive payments, could have resulted in tax avoidance in VAT, consequently affecting tax collection measurements. In the previous section we estimated a large discrepancy in the volume of actual and potential VAT collection in case of Armenia. Additionally, as we have mentioned in the literature review section, a study of an enterprise with similar starting conditions defined large levied tax disparities due to a type of a tax mode the firm operated in. The analysis concluded that both presumptive taxes in addition to the lower effective tax rates were also simpler to comply with internal tax accounting and tax filing to authorities, therefore presumptive taxation could have incentivized tax avoidance in Armenia (Sedrakyan, 2007). Next, we develop a methodology in order to test whether presumptive taxation contributes to the inefficiencies causing reduced tax revenue mobilization in Armenia.

Basically, we utilize regression analysis to explain the behavior of potential tax collection performance, measured as tax effort index and taxable capacity. The actual revenues from presumptive tax modes, simplified tax and presumptive payments, and VAT are used as explanatory independent variables and calculated as ratios of GDP. The multiple regressions have the following form:

$$tax\ effort\ index_i = a + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \varepsilon_i \quad (5)$$

$$taxable\ capacity_j = b + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon_j \quad (6)$$

where, the independent variables below are used in both equations:

X_1 -vector of collected VAT to-GDP ratio

X_2 -vector of collected simplified tax-to GDP ratio

X_3 -vector of collected presumptive payments-to GDP ratio

ε_i and ϵ_j -standard errors

α_i and β_j -vectors of coefficients that influence independent variables

a and b -constants

The analysis is performed including periods from 1997 to 2015.

The null hypothesis for equation (5) suggests that H_0: $\alpha_1 = \alpha_2 = \alpha_3 = 0$, and the null hypothesis for equation (6) test suggests that H_0: $\beta_1 = \beta_2 = \beta_3 = 0$, indicating that coefficients associated with the independent variables do not impact the dependent variables. Both regressions are using three independent variables and they describe 91.6% of variation in tax effort index and 63.19% of variation in taxable capacity with R-squared statistics being equal to $R^2 = 91.6$ and $R^2 = 63.19$, respectively. The 5% critical value for a two-tailed t-statistics test with $df = 15$ is $[-2.131; 2.131]$ and it is derived as $t_i = \beta_i / SE_i$ and in order for it to be significant it should exceed the critical values for the $t - statistics$ test. Thus, in both regression models the $t - statistics$ for two independent variables exceeds critical values associated with the $t - statistics$ and those are collected VAT-to GDP and simplified tax-to GDP variables. The $p\ value < 5\%$ defines the significance of a given explanatory variable in the model, and, indeed, the p-values associated with collected VAT and simplified tax meet that test requirement confirming these variables are significant in both regression models with confidence interval at 95% and we reject the null hypothesis for both tests.

4.2 Results

The summary assessment of the OLS simulation results of $VAT\ effort\ index_i$ (TEI) and $VAT\ taxable\ capacity_i$ (TC) as dependent variable is presented in the Table 1 below and more details are in the Tables 6 and 7 of the Appendix:

Table 1: Summary statistics of the OLS simulation results corresponding with equations (5) and (6)

Dependent variable	VAT tax effort index (TEI)			VAT taxable capacity (TC)		
Independent variable	VAT-to GDP (X_1)	Simplified Tax-to GDP (X_2)	Pres. Pay.-to GDP (X_3)	VAT-to GDP (X_1)	Simplified Tax-to GDP (X_2)	Pres. Pay.-to GDP (X_3)
Coefficient	0.04	0.10	-0.03	0.55	-4.00	0.99
Standard error	0.00	0.03	0.02	0.15	1.20	0.89

Based on the summary statistics in Table 1 above and Table 6 it is said that 1 percentage point increase in VAT-to GDP leads on average to 0.044 percent increase in VAT effort index and VAT-to GDP is a significant independent variable for estimating TEI, holding all other variables constant[7]. Additionally, 1 percentage point increase in the ratio of simplified tax-to GDP leads on average to 0.10 percent increase in VAT effort index and simplified tax is a significant independent variable for estimating TEI, holding all other variables constant. Presumptive payments mode does not have a significant effect on TEI.

Similarly, based on the summary statistics in Table 1 above and Table 7 it is said that 1 percentage point increase in VAT-to GDP leads to 0.55 percent increase in VAT taxable capacity and VAT-to GDP is a significant independent variable for estimating TC. Additionally, 1 percentage point increase in the ratio of simplified tax-to GDP leads to 4 percent decline in VAT taxable capacity and simplified tax-to GDP is a significant independent variable for estimating TC. Presumptive payments mode does not have a significant effect on TEI. We can also observe

[7] Note, in this study: $TE_i = VAT\ effort = \frac{collected\ VAT}{GDP}$ vs. $TEI_i = VAT\ effort\ index = \frac{collected\ VAT}{potential\ VAT}$

a higher magnitude of the effect of presumptive tax modes on taxable capacity than on tax effort index.

To further unravel the multiple regression results with regards to the effect of simplified tax on the tax effort index we refer to the main definition of TEI, from (4), where TEI is a ratio of two ratios: VAT-to GDP and VAT capacity.

$$TEI_i = \frac{TE_i}{TC_i} = \frac{\frac{Collected\ VAT_i}{GDP_i}}{\frac{Potential\ VAT\ revenue_i}{GDP_i}} = \frac{Collected\ VAT_i}{Potential\ VAT\ revenue_i} \quad (7)$$

The positive sign of TEI_i ratio can be a result of two cases, when both nominator and denominator are positive or when both are negative. After closer review of the effect of simplified tax in multiple regression outcomes (Tables 6 and 7) the intuition suggests that if the simplified tax has such a significant and negative effect on taxable capacity (TC_i), and because the same simplified tax has a significant positive effect on tax effort index (TEI_i), then in order to reach this positive significant effect in TEI_i, the tax effort (TE_i) or ratio of collected VAT-to GDP should also be negative. In order to test for this information we conduct another OLS regression, where (TE_i) is a dependent variable and ratios of simplified tax and presumptive payments to GDP, TEI and TC are independent variables (Table 7a) and the summary of coefficients and standard errors are presented in the Table 2 below:

Table 2: Summary statistics of the OLS simulation testing effect on VAT-to GDP ratio

Dependent variable	VAT effort =TE=VAT/GDP			
Independent variable	Simplified Tax-to GDP (X_2)	Pres. Pay.-to GDP (X_3)	VAT effort index	VAT taxable capacity (TC)
Coefficient	0.01	0.04	17.27	0.43
Standard error	0.08	0.05	0.18	0.01

The results from new multiple regression analysis suggest that while the simplified tax has a positive coefficient (0.01); however, this variable is insignificant to explain the VAT-to

GDP ratio. Therefore, while the math behind the intuition associated with equation (7) suggests that the effect of simplified tax-to GDP on VAT-to GDP is rather negative; however, OLS regression does not provide enough evidence to support it. This outcome singles out a case, where analysis of only tax effort index alone would mislead researchers, since would point out on positive effect of simplified tax on tax effort index. In reality, while mathematically this value is positive; however, this outcome is reached because both components: the numerator and denominator of the division equation have negative signs.

Applied to economics, both components of division equation (7) are tax performance measurements and therefore additional investigation is needed to identify their effect more precisely. Based on the results from the TC regression analysis (Table 7) we can summarize that even a small increase in **simplified tax** leads to a substantial tax base erosion associated with general tax regime through business subdivision, bribery and other techniques to reduce turnover and continue being taxed in simplified tax with lower tax rates and more relaxed compliance regulations. Additionally, based on the results of regression, where TE is a dependent variable (Table 7a), since the effect of simplified tax on actual VAT collection is insignificant, we can assume that tax administration mechanisms to improve VAT collection do not contribute to the effort of reducing VAT avoidance through targeting the tax loopholes induced by specifics of regulations in simplified tax. One of the main characteristics of the simplified tax is a similar to VAT tax base, which is gross sales in the reported period, where an enterprise with lower sales is being taxed via the simplified tax. The similarity in tax base calculation can facilitate the VAT base erosion. In that, only very thorough tax audit and surveillance at the enterprise site can detect tax avoidance and this work is time and resource consuming exercise. Therefore, this is an issue to resolve by addressing simplified tax regulations rather than tax administration strategies.

A similar test of the effect of presumptive payments on measurements of potential VAT collection is applied through the division components of TEI. The results of the multiple regression analysis are presented in the Table 7a of the Appendix and the summary of coefficients is in the Table 2 above. The effect of presumptive payments on TEI is insignificant and negative with coefficient estimate potentially taking any result in the range between$[-0.075: 0.0203]$, with 95% confidence interval is used (Table 6). Similarly, both components of TEI, as taxable capacity and tax effort, also have insignificant effect on VAT measurements (Tables 7 and 7a).

Thus, the all three tests identifying whether the **presumptive payments** mode have any significant effect on VAT actual or potential performance measurements suggest there is no considerable relation occurring from the change in presumptive payments-to GDP ratio. Here, we can summarize that presumptive payments targeting specific business activities is a viable tax mobilization tool, which does not affect VAT collection measurements. The tax regulations addressing presumptive payments are well-defined and they do not to contradict with general tax mode. The tax administration mechanisms targeting to improve tax mobilization will be useful for increasing tax revenues in both VAT and presumptive payments.

Similarly, if tested for the effect of actual **VAT** collection on VAT tax effort index and taxable capacity, both measurements of potential tax collection performance are positive and significant. This is an expected result meaning that VAT regulations support higher tax collection and the improvement of tax administration strategies and tools will positively contribute in both actual and potential VAT collection (Tables 6 and 7).

V. STUDIES OF BIDIRECTIONAL CAUSALITY BETWEEN VAT AND PRESUMPTIVE TAXES

5.1 Methodology

This section disentangles further the effects that presumptive taxation may have on VAT collections and some specifics on how the changes in VAT may impact presumptive taxes, using the study horizon of 18 periods. The Vector Autoregression (VAR) methodology is used for the analysis. A standard practice in this methodology is to report results of Granger causality test for conducting short-term analysis and Forecast Error Variance Decomposition (FEVD) and Impulse-Response Function (IRF) tests for studying the long-term interactions of variables (Stock and Watson, 2001). In order to use VAR function there are preliminary conditions that the time-series and the VAR function should satisfy. The time series should meet stationarity requirements, which we determine by applying Augmented Dickey Fuller (ADT) test. Also, before proceeding with causality tests, we examine the VAR function on stability, autocorrelation, and heteroscedasticity.

VAR is used as a preliminary step for running other tests in the system to further define causal (in our case focusing specifically on bidirectional) behavior of the multivariate time series in the short and long-term perspectives. This test includes a system of OLS equations where each variable is treated as endogenous, provided that the model includes enough lags of all variables and the equations satisfy the heteroscedasticity and autocorrelation assumptions for time series regression. The VAR function models time series in terms of their past and each equation includes an error that has zero expected value given past information on studied variables. Thus, for defining the effect of all other studied variables on VAT- to GDP the VAR builds the following equation:

$$X_t = \partial_0 + \sum_{j=1}^{m} \alpha_j X_{t-j} + \sum_{j=1}^{m} \beta_j Y_{t-j} + \sum_{j=1}^{m} \gamma_j Z_{t-j} + \sum_{j=1}^{m} \vartheta_j TEI_{t-j} + \sum_{j=1}^{m} \mu_j TC_{t-j} + \varepsilon_i \quad (8)$$

Further, for defining the causal effect of all other studied variables on Simplified tax- to GDP the VAR builds equation:

$$Y_t = \delta_0 + \sum_{j=1}^{m} \pi_j X_{t-j} + \sum_{j=1}^{m} \rho_j Y_{t-j} + \sum_{j=1}^{m} \sigma_j Z_{t-j} + \sum_{j=1}^{m} \tau_j TEI_{t-j} + \sum_{j=1}^{m} \varphi_j TC_{t-j} + \epsilon_i \quad (8a)$$

For current study VAR function analyzes total of five OLS equations, where remaining three ($Z_t, TEI_t \; and \; TC_t$) variables are presented similar to the equations (8) and (8a) with $lag = 2$.

Where $X_t, Y_t, Z_t, TEI_t, TC_t$, are stationary time series and

X_t- $VATto\ GDP_t$

Y_t- $Simplified\ Tax\ to\ GDP_t$

Z_t- $Presumptive\ Payments\ to\ GDP_t$

TEI_t- $Tax\ Effort\ Index_t$

TC_t- $Taxaxable\ Capacity_t$

$\alpha_j, \beta_j, \gamma_j, \vartheta_j, \mu_j, \pi_j, \rho_j, \sigma_j, \tau_j \varphi_j$ – vectors of coefficients

$\varepsilon_i, \epsilon_i$ –error terms

t- 2015 (tests using VAR are modeled for the period from 1997 to 2015)

In ADF test the null hypothesis assumes the variable contains a unit root, and the alternative is that the variable is generated by a stationary process. We apply 5% critical value as a significance level for the test results. In our analysis while the majority of the data is stationary at levels, the tax effort index (TEI) turns stationary at first difference (Table 8). Therefore, the VAR function associated tests in this section are performed using first differenced data. Further, we apply a series of tests to confirm whether the properties of specifications have been well-defined. Thus, the outcomes for LM and Eigenvalue stability condition tests are presented in Tables 9 and 10 confirming that the model specifications are well-defined. There is no

autocorrelation at lag order and VAR function satisfies stability conditions. Furthermore, for heteroscedasticity investigation and as the Breusch-Pagan/ Cook-Weisberg does not run a multi-system OLS equation as VAR does, the multi-system OLS equation is separated into five separate OLS equations. Each of five studied variables is used as a dependent variable and other four variables as independent and regressed as an OLS equation, where Breusch-Pagan/ Cook-Weisberg heteroscedasticity test results satisfy homoscedasticity conditions.

We use *Granger causality test* to define short-term causality of endogenous variables (Granger, 1969). The simple model with two endogenous variables can be written as:

$$X_t = \partial_0 + \sum_{j=1}^{m} a_j X_{t-j} + \sum_{j=1}^{m} b_j Y_{t-j} + \varepsilon_i \quad (9)$$

$$Y_t = \delta_0 + \sum_{j=1}^{m} c_j X_{t-j} + \sum_{j=1}^{m} d_j Y_{t-j} + \epsilon_i$$

The $X\ and\ Y$ are stationary time series, as per ADF test results we use first-differenced data. The null hypothesis of the test for unidirectional causality is that all past values of Y_t do not cause X_t and can be written as $H_0: b_j = 0$, or in other words, the coefficient associated with Y_{t-j} is 0. If probability $\rho < 5\ percent$, we can reject the null hypothesis, which would mean there is a short-run causality running from Y_t to X_t. Additionally, if we define a situation, where Y_t causes X_t, and simultaneously X_t causes Y_t, where $H_0: b_j = c_j = 0$, there is said to be a feedback relationship between X_t and Y_t meeting bidirectional Granger causality hypothesis requirements, if $\rho < 5\ percent$ for both variables (Granger, 1969). The results of Granger causality test are in the Table 11. Thus, for variable X_t discussed in the equation 8 the null hypothesis of Granger causality test is that all other variables with the lag=2 do not cause X_t and can be written as $H_0: \alpha_j = \beta_j = \gamma_j = \vartheta_j = \mu_j = 0$, suggesting that coefficients associated with other endogenous variables are 0. When the estimate of $\rho\ value < 5\ percent$ significance level, we

can reject the null hypothesis and declare significant causal relation running from a given endogenous variable to X_t. For bidirectional causality the null hypothesis considering (8) and (8a) is $H_0: \beta_j = \pi_j = 0$, suggesting feedback relation of variables X_t *and* Y_t. The same intuition is applied when summarizing the test outcomes for other variables in the equations (8), (8a), etc. described earlier in this section.

Finally, the *impulse-response function* (IRF) and *forecast error variance decomposit*ion (FEVD) tests are used for studying the long-term effect of presumptive methods of taxation on VAT collection, and conversely. In 1980 Sims proposed the IRF and FEVD tests as essential part of VAR methodology and the both techniques are important tools in interpreting the studied VAR model in long-term perpective (Sims, 1980). These tests track the evolution of the shock through the VAR system (Swanson and Granger, 1997). The IRF method defines response of a studied variable to a unit change, which can be described as shock or innovation, in the value of one of the VAR errors. Assuming that all other errors are zero, then the studied VAR error would return to zero in further periods. More formally, if a VAR system presented in equations (8), (8a), etc. is considered with a time-lag $(t - j)$ the IRF identifies the responsiveness of the endogenous variables in the system when a unit shock or impulse is applied to the error terms $\varepsilon_i$and ϵ_i.

The FEVD method estimates the percentage of the variance of the error in each of the forecasted variables, which can be explained by shocks to other variables in the same VAR system. Both tests are based on the VAR function applied to the equations described in (8) and (8a) with $lag = 2$.

5.2. Results

The summary statistics of *Granger causality* is reported in Table 11 and the same table presents a separate section of the indicators meeting bi-directional causality hypothesis requirements discussed in the methodology section.

Thus, based on the results presented in Table 11 the causal effect of other variables on **actual VAT** collection is insignificant, except for simplified tax. The intuition here would be: if presumptive taxes are effectively designed in consideration to VAT, the test should not detect significant unidirectional Granger causality, since these are supplemental tools to mobilize extra revenues in addition to actual collected VAT. To the contrary, we would expect actual VAT-to-GDP perform a significant unidirectional causality to both presumptive taxation modes. This is due to design of both presumptive taxation modes, which have VAT in their tax structures. The methodological specifics of designs of presumptive taxes were discussed in section 4.1 and Appendix 1. The test results confirm that, indeed, VAT has a significant causal effect on both presumptive taxes, where simplified tax (p-value is 0.027 or 2.7 percent) and presumptive payments (p-value is 0.00) have a p-value below 5 percent and we can reject the null hypothesis.

A short-run causality running from **simplified tax** to VAT (*p-value is 0.049 or 4.9 percent*) is revealed, suggesting that the design of simplified tax in consideration to actual VAT is not effective. There is also a short-run Granger causality from VAT to simplified tax (*p-value is 0.027*). This is an example of bi-directional causality hypothesis, which asserts feedback relation running from simplified tax to VAT, and conversely. Moreover, there is a causal effect running from tax effort index (*p-value 0.028*) and taxable capacity (*p-value 0.048*) to simplified tax and the latter is bi-directional, which shows that change in simplified tax causes change in taxable capacity (*p-value 0.008*), and vice versa.

As a summary, we can assert that VAT actual and potential collections have a significant impact on the simplified tax. Further, as we have estimated from 4.2, the effect of simplified tax on potential VAT collection is negative. These two pieces of information suggest that the simplified tax has been used as a tax avoidance tool. Thus, the simplified tax significantly declines, when measurements to improve potential tax collection are implemented. If the efforts of formal VAT disclosure are exhausted, it contributes to a substantial increase in simplified tax, which, as we have seen previously, is achieved by tax base erosion, subdivision of enterprises and other tax avoidance techniques. Moreover, the bi-directionality of simplified tax and actual VAT suggests that these taxes are used interchangeably. Further, the feedback relation can also be a result of factors having a short-term effect on both taxes, such as economic development, tax reforms contributing to the promotion of new businesses, etc. Thus, since both taxes have a similar tax base, the start-ups with lower turnover register as simplified taxpayers, while the new organizations with more sophisticated operations and higher turnover are required by law to register their operations in general mode of tax reporting and pay VAT. However, the latter ones tend to report lower turnover and take advantage of simplified tax mode. Therefore, the inverse bidirectional effect between simplified tax and VAT taxable capacity can be explained if we consider one of the main objectives for simplified tax to be promotion of small and medium enterprises (SMEs), in anticipation of increased tax revenue streams in the future, when the firms become larger and more stable, so they can be taxed in general tax mode. However, when they become larger, instead of paying due VAT they use tax avoidance tools and continue their operations in the simplified tax. Additionally, a time lag over which the tax authorities reveal informal operations and omitted information in business reporting contributes to the negative

feedback relation between VAT taxable capacity and simplified tax. Here, we can assume that the simplified tax created tax loopholes and was used as a tax avoidance tool.

While all studied indicators have an effect on **presumptive payments** (*p-value is 0*), except for simplified tax (*p-value is 0.059*), however, presumptive payments only have an effect on taxable capacity (*p-value is 0.012*) and this causal relation is also consistent with the bi-derctional causality hypothesis. Therefore, the intuition suggests that any efforts to improve actual or potential VAT also positively contribute to mobilization of presumptive payments. Therefore, in addition to measures for improved taxable capacity, such as economic development, tax reforms, etc., other upturns, such as enhanced tax administration techniques, introduction of tax surveillance measurements, etc., that have positive effect on actual VAT will also positively contribute to collection of presumptive payments. Here, we can assume that presumptive taxes serve as an effective supplemental tax collection tool.

Furthermore, only actual collected VAT-to GDP ratio (*p-value is 0.007*) and taxable capacity (*p-value is 0.009*) have a short term causal effect on **tax effort index** (TEI), which shows that presumptive tax modes have an indirect impact on TEI. If the discussion of TEI from section 4.2 and equation (7) is recalled that indirect impact from presumptive taxes is affecting TEI measurement either through TE (tax effort) or TC (taxable capacity) ratios.

Finally, the Granger causality test results confirm that **taxable capacity**, by performing bidirectional causality with all studied measurements (except for VAT ratio (*p-value is 0.339*)), indicates the complex character of this metrics that can be affected by both studied in the VAR tests variables and externalities, which are considered in designing the methodology of our study in section 3.1, such as GDP, net taxes, sectors of net-export, agriculture, VAT rate, tax rates and VAT recounting rates in presumptive modes. And because VAT taxable capacity is such a

complex indicator, any fiscal reforms and refinements of tax administration techniques targeted to increase this measure will also significantly impact presumptive tax modes in the economy. However, as we saw above when describing causality specifics of presumptive tax modes, for the simplified tax the direction of the effect is an inverse one, while for presumptive payments it is direct. This difference is due to a design of how the tax base for each presumptive tax mode is generated, enabling in some instances inefficiencies and creating tax loopholes.

The discussion of *IRF and FEVD tests* results are summing-up our studies of the bidirectional effects of presumptive taxation mechanisms and measurements of VAT actual and potential collection (Tables 12 and 13 respectively). Here we discuss a long-term effect of presumptive taxation modes on VAT, and conversely. The forecast horizon for both tests is 18 periods. The IRF test results analyze situations when a unit shock or impulse is given to the error term of one of the variables in the VAR system, and the corresponding response received by other variables (Table 12). On the Table 12 in the title of each figure the first variable is an impulse and the second variable is a response to the unit shock.

Thus, first row of Table 12 represents the IRF test results for equation (8), where a unit shock or innovation is given to the error term ε_i of X_t or actual VAT-to GDP ratio and four figures of the first raw are the corresponding responses of each variable in the VAR system. Similar intuition is applied to conduct the IRF test on other variables in the VAR system.

A **unit shock given to the error term of actual VAT-to GDP ratio** leads to a negative response in the simplified tax, which declines significantly and this negative response lasts for 5 periods (Table 12, first test outcome). Presumptive payments-to GDP ratio positively reacts to the unit shock in actual VAT-to GDP ratio in period 1, in period 2 it declines, further recovers and stays neutral starting period 5 onward. A unit shock in actual VAT-to GDP ratio

leads to a single-period decline in tax effort index and then it recovers and stays positive until period 7. A unit innovation in actual VAT has a strong and long-lasting effect on taxable capacity. This information asserts that simplified tax has a long-term negative response to any improvements in actual VAT. Similar positive change has a smaller magnitude effect on presumptive payments, which take time to adjust, followed by neutral reaction. Significant improvement in taxable capacity confirms that a small positive change in the tax system, fiscal policy or tax administration of VAT today will have a significant and long-lasting impact (5 periods) in potential tax collection. Consideration of the time horizon that an economic indicator reacts to a unit change in another indicator is also very significant for tax managers since this information can serve as guidance for implementation of reforms and innovations based on the time-appropriate schedules associated with specific goals.

A unit shock given to the error term of simplified tax-to GDP ratio leads to a negative and significant response from actual VAT-to GDP ratio and it lasts for more than 10 periods. Response of actual VAT-to GDP, tax effort, and taxable capacity on a positive shock in simplified tax-to GDP ratio is very interesting, especially if considered our discussion from section 4.2 These three tables (Table 12, row 2) visually demonstrate our empirical discussion of the essence of tax effort index. Here we see that while VAT-to GDP and taxable capacity have a significant negative magnitude of reaction to a small shock or improvement in simplified tax, the tax effort index does not perform significant negativity and its variation is only in the range of (-0.2; 0.2), in comparison the range of magnitude of the same innovation on both VAT-to GDP and taxable capacity is (-6;5) with the values predominantly being below 0 over the 10 year time-horizon. The negative effect of simplified tax to actual VAT defined in this test is also essential, since previously conducted OLS and Granger causality tests did not provide significant evidence

to prove this point. With this test we have enough econometric evidence to support intuition in equation (7) of section 4.2 concerning negative sign of both nominator and denominator. Presumptive payments take two periods to adjust to the shock in simplified tax and perform neutrality starting period 3 onward.

A unit shock given to the error term of presumptive payments-to GDP ratio leads to another interesting outcome. Again, the response of actual VAT-to GDP, tax effort, and taxable capacity to a positive shock in presumptive payments-to GDP ratio is reviewed in the frame of our discussion from section 4.2. These three tables (Table 12, row 3) confirm that presumptive payments do not distort the tax base of VAT. Any improvements in presumptive payments, such as more effective tax administration, lead to the increase in actual and potential VAT. Interestingly, VAT capacity immediately and positively responds to a positive impulse in presumptive payments; however, actual VAT-to GDP takes two periods to adjust and the adjustment leads to a decline in tax effort index for two periods.

The reaction of actual and potential VAT measurements to unit shocks in ratios of simplified tax and presumptive payments-to GDP contrasts two cases. In one case a positive shock in a presumptive tax has a long-term distortive impact (simplified tax regime). In another case, a positive shock to a presumptive tax leads to a short-term adjustment in VAT measurements and react positively moving forward (presumptive payments).

From the graphs associated with the effect of VAT and the two presumptive taxes on a **unit innovation in taxable capacity** shows that actual VAT-to GDP has a higher magnitude of response and first response is positive, then it declines and stays negative. This can be interpreted as taxpayers follow tax compliance rules and pay VAT in the period 1, then they try to identify loopholes or avoid paying VAT tax all together. The graphs associated with simplified tax and

presumptive payments confirm this assumption: simplified tax goes up in the same period with unit innovation in taxable capacity and presumptive payments increase starting period 2, while VAT declines, which also proves that tax surveillance mechanisms are not efficient to bind taxpayers to follow adopted tax regulations. Additionally, if we recall that improvement in simplified tax leads to further decline in both actual and potential VAT, we can summarize that any VAT reforms targeted to increase VAT mobilization will not be sustainable and will be contributing to tax avoidance through simplified tax.

The responses of studied variables for tax collection to **a unit innovation in tax effort index** replicate pattern already discussed for the case of taxable capacity with much higher magnitude of response.

Based on the *FEVD test* results the power of actual VAT has the strongest effect on the variance of forecast error of all remaining variables considered (Table 13). The power of simplified tax has comparatively strong effect on the variance of error in actual VAT, tax effort index and taxable capacity. The power of presumptive payments is attributed to the variance forecast error of simplified tax and taxable capacity. The powers of taxable capacity and tax effort index do not have an effect on variance of forecast error in all three taxes in period 1, which shows that efforts taken to improve potential tax revenue indicators do not lead to immediate results. In case of actual VAT the actual change is seen in period 2, in case of presumptive payments in period 3 and in case of simplified tax in period 5. Moreover, the power of VAT effort index and taxable capacity has a stronger effect on ratio of presumptive payments-to GDP than ratio of VAT-to GDP, which can be assumed that improvement of tax compliance and administration mechanisms in VAT also highly attribute to the revenue mobilization in presumptive payments.

The IRF and FEVD test results support our hypothesis that, indeed, there is a significant causal relation running from simplified tax-to GDP to actual VAT-to GDP. In addition, this section has defined that relation meets bidirectional causality hypothesis requirements and the relation between these two tax collection indicators is an inverse one. The same is true in the case of bidirectional inverse relation between simplified tax-to GDP and VAT taxable capacity and in both cases it has a long term effect. Additionally, over time the negative effect of the simplified tax on taxable capacity is strengthening while the effect of actual VAT is weakening. This consolidated information suggests that simplified tax has a highly distortive effect on VAT collection and over time this negative influence growth stronger. It also suggests that efforts to improve tax collection in VAT are ineffective and only cause more taxpayers to seek tax loopholes and to switch to simplified tax mode. Our final result suggesting ineffectiveness of simplified tax as presumptive tax mechanism in Armenia corresponds with some of the study results conducted in other ECA countries (World Bank, 2011; Engelschalk and Loeprick, 2015).

In contrast to the ineffectiveness of simplified tax mode, the study also defines that presumptive payments have been useful and effective presumptive tax mode. Thus, the long-term positive feedback relation of presumptive payments and VAT taxable capacity suggests that tax reforms and administrative efforts to improve collections in one of the taxes lead to an improved revenue collection in the other. Additionally, the impact of presumptive payments on VAT collection indicators is not as overwhelming as we observed in case of simplified tax.

VI. CONCLUSION

This study offered a comprehensive analysis of the impact of presumptive taxation modes on VAT and estimated that a poor design of a presumptive tax may have a very distortive impact on the budget revenue streams and encourage tax avoidance and evasion. There is a risk of creating taxes that over time transform from being a presumptive tax to becoming an interchangeable one with much beneficial tax features. The more beneficial tax features in the environment of ineffective tax administration may over time distort the efficiency of the whole tax system and create tax loopholes. This is especially important, when the capacity of revenues from presumptive taxes is significantly lower from the tax revenues in general taxes by yielding tremendous budget revenue reductions. Hence, in the environment, where presumptive and general tax modes have inverse bidirectional feedback, it would be more helpful to review the presumptive tax legislation and amend the features which caused the negative feedback relation. The case study applied to Armenia revealed that the tax design of simplified tax that replicated the tax base for VAT led to distortion of the tax system. To the contrary, the effect of presumptive payments (different from VAT tax base) on VAT was positive in the long-run, suggesting that presumptive payments did not distort VAT revenue streams and reforms in one tax also contributed to the increased revenues in another tax.

The offered new methodology for assessment of a true potential VAT base not only defined a comprehensive nature of taxable capacity as a derivative of potential VAT base (section 3.1), but also contributed in our understanding of the effect of presumptive taxes on VAT. Due to the methodology design, ideally, it is expected not to identify a statistical significance running from presumptive tax modes to VAT taxable capacity. This neutrality assesses that presumptive tax modes are well-designed and do not impact potential VAT

mobilization efforts. Another positive case scenario is a situation of a positive relation of presumptive tax modes in association with VAT taxable capacity, suggesting that fiscal reforms in presumptive taxes also will positively contribute to VAT taxable capacity. This effect will show that while these two tax modes are not completely independent from each other; however, they tend to improve the overall budget revenues. Nevertheless, it is highly undesirable to derive a situation, where a presumptive tax performs a statistically significant inverse impact on VAT taxable capacity, suggesting that any improvements targeted to increase VAT base and potential VAT collection push a large number of taxpayers to avoid taxes by using tax legislation loopholes for getting lower tax rates and more simple tax filing routine offered by the presumptive tax. The case analysis applied to Armenia describing causality specifics of presumptive tax modes on VAT taxable capacity derived two of mentioned situations; it detected a direct order in case of presumptive payments and an inverse order in case of simplified tax.

Finally, this study assessed that in the context of a single country study, if tax effort index is used to assess the effect of presumptive taxation on VAT mobilization, it would be more useful to evaluate separately tax effort and then taxable capacity. As, in some instances, both division components of a tax effort index may have negative signs yielding a misleading positive interpretation of the indicators.

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LIST OF ACRONYMS

ADF	-Augmented Dickey-Fuller test
AMD	-Armenian Dram (currency used in Republic of Armenia)
C	-Consumption
ECA	-Eastern Europe and Central Asia
EX	-Export
FEVD	-Forecast Errors Variance Decomposition
G	-Government Spending
GDP	-Gross Domestic Product
I	-Investments
IM	-Import
IMF	-International Monetary Fund
IRF	-Impulse-Response Function
LM test	-Lagrange multiplier test
NI	-Net Import
NT	-Net Taxes
NX	-Net Export
OLS	-Ordinary Least Square
PT	-Presumptive Tax
S_{ni}	-Sector of Economy
Sq.m	-Square Meter
SME	-Small and Medium Enterprises
TE	-Tax Effort
TEI	-Tax Effort Index
TC	-Taxable Capacity
VAR	-Vectot Autoregression Function
VAT	-Value Added Tax

ANNEXES

Appendix 1. Comparison of general and presumptive tax modes

Every sector of the economy in Armenia can be taxed in one of the three tax modes: general (combination of VAT and corporate income tax), simplified tax and presumptive payments. Simplified tax and presumptive payments are supplemental tools for generating additional revenue streams and in this study are referred as presumptive tax modes/mechanisms. Enterprises with similar starting terms, depending upon in which tax mode they operate, will have different tax liabilities[8]. Thus, the discrepancy of tax burden in simplified tax and general tax mode reaches more than 23 percent, if the profitability of organizations changes from 10 percent to 80 percent[9].

The main characteristics of tax modes are the following[10]:

The tax base for **VAT** and **simplified tax** is gross sales. Simplified tax mode is more focused on small and small-to-medium entrepreneurs (annual ceiling is 50 million AMD[11]), based on the quarterly volume of the sales. If the quarterly volume of sales exceeds the government's estimates then the business is automatically transferred to the general tax mode. The VAT counts for 60% and corporate income tax for 40% of the tax collection.

The **presumptive payments** mode targets specific industries or business activities, as such auto-transportation services, public catering, casinos, etc. are taxed in presumptive payments. Depends on the type of service the tax base of presumptive payments differs and it can be calculated based on particular business related parameters, as such the number of vehicles used in the auto-transportation service, the location and size of the area for catering service, etc. Similar to simplified tax, in presumptive payments the share of VAT counts 60% of collection, and the share of corporate income tax is 40%, respectively.

For both presumptive tax modes the tax rates are lower, the tax accounting and procedure of submission of tax returns to the authorities is substantially simplified.

The general taxes are applied to all other business activities. The taxpayers are taxed separately at a 20% VAT and 20% corporate income tax rate. Tax calculation and submission is more complex here, especially for large taxpayers.

In 2010 and in 2012 the government introduced two new taxes: patent fee and turnover tax, respectively. The tax base accounting for patent fee is very similar to presumptive payments; however, it targets specific extra-small business activities with a single owner-employee. Turnover tax is a replacement for simplified tax and as such this study views the revenue collected from turnover tax as simplified tax starting from 2013.

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[11] AMD is a national currency of Republic of Armenia, for comparison the USD/AMD exchange rate on 04.12.2017 is 1USD=486AMD

Table 1. Contribution of total tax revenues and VAT-to GDP and ratios of VAT and presumptive taxes in total tax revenues

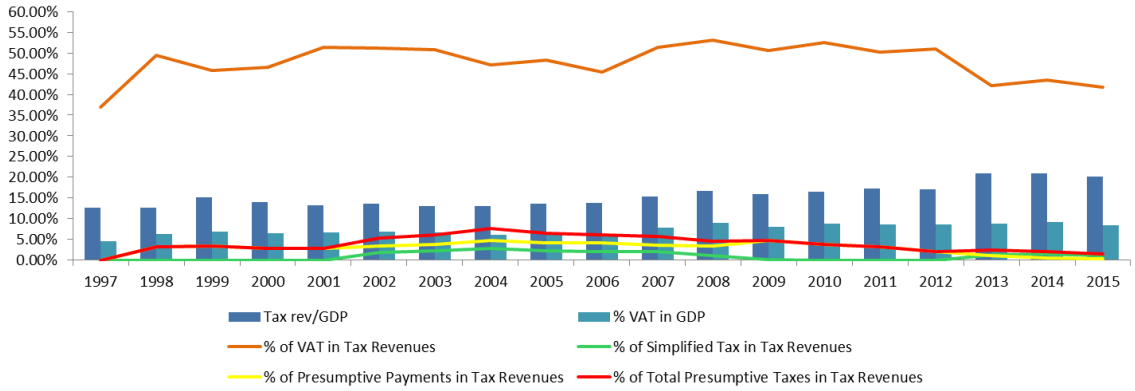


Table 2. Annual change in GDP, tax revenues, and actual and potential VAT measurements

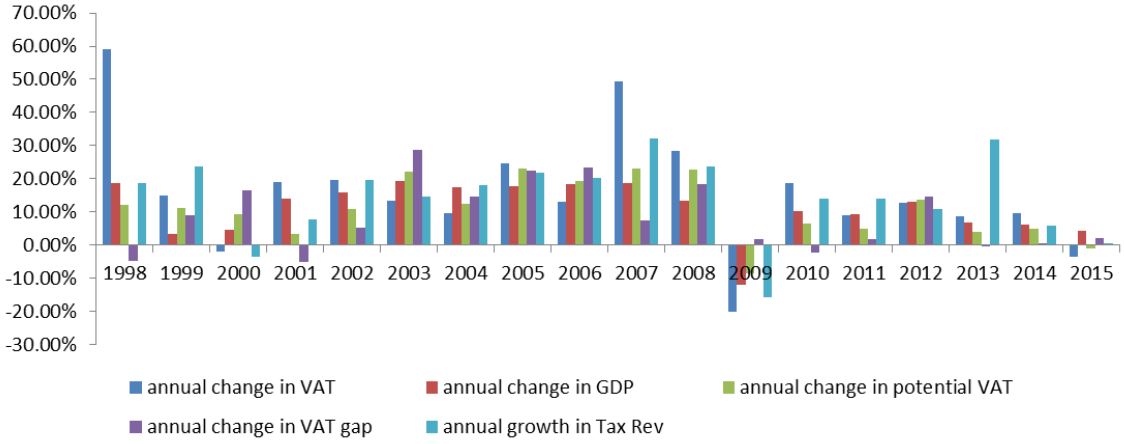
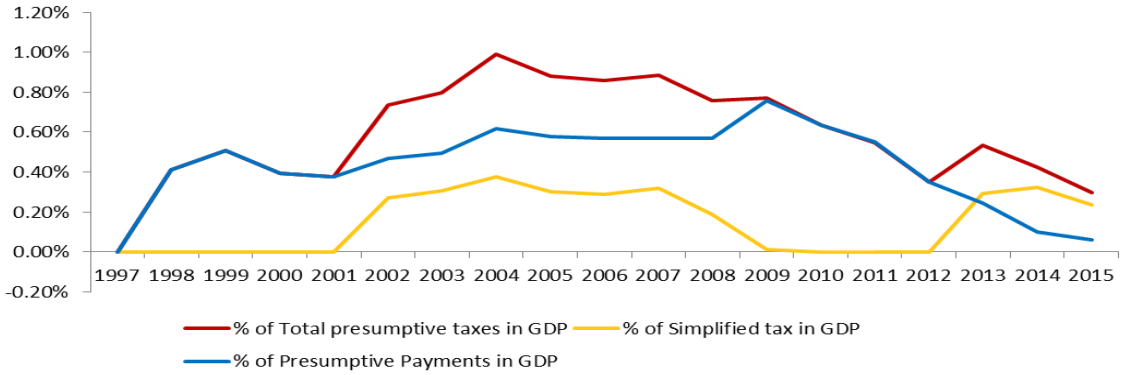


Table 3. Ratio of tax effort from presumptive taxes[12]



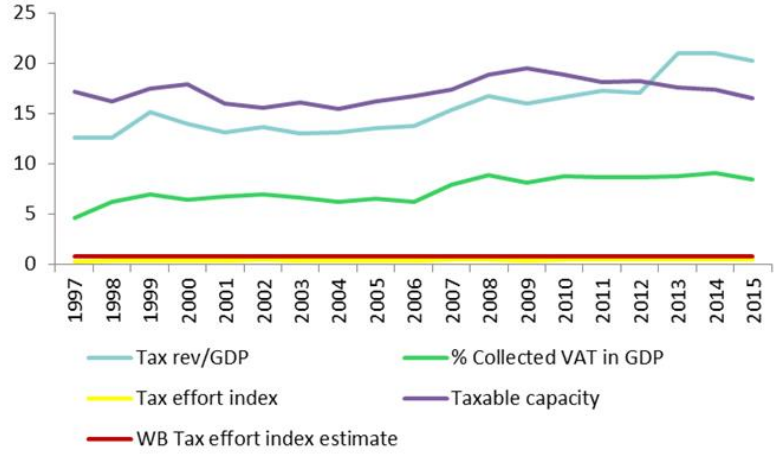
[12] Ratio of actual tax collection-to GDP. Data sources: National Statistical Service of the Republic of Armenia. The statistical yearbook of Armenia, years from 2001 (1996-1998) to 2016, http://data.worldbank.org/indicator and http://www.oecd-ilibrary.org/taxation/revenue-statistics-2016_rev_stats-2016-en-fr

Table 4. Estimates of VAT tax effort index and VAT taxable capacity (in national currency, AMD)** [13]

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tax effort index	0.2711442	0.3833197	0.3952439	0.3613615	0.422523	0.4491405	0.4118296	0.40023	0.4049689	0.373482	0.4532841	0.4738064	0.4142031	0.462524	0.4797549	0.4753187	0.502368	0.5250266	0.50918
Taxable capacity	17.152931	16.250161	17.492516	17.916163	16.005517	15.525355	16.107562	15.440438	16.160106	16.724297	17.376503	18.828003	19.531063	18.852766	18.123527	18.227773	17.560379	17.370181	16.54543
Collected VAT	37409	59511	68270	66771	79521	95006	107769	117903	146783	165912.2	248007.1	318313	254158.1	301724.5	328482.8	369661.6	401884.7	440361.4	423933.5
(GDP-Agriculture-Net Taxes)*20%	76847.2	92960.6	118368.8	131160.2	142243.76	170599.22	211360	246540	309580	373460	438120	505300	455115	496039	518803.88	608833.28	641870.18	681932.08	725483.4
Net Import *20%	61120	64640	57360	56040	48620	46940	58100	59400	64700	84420	125760	182760	172980	169460	178300	177768.9	180748.98	178479.62	123185.9
(Presumptive Payments + Simplified Tax+Turnover Tax)*60%	0	2349	3000	2424	2658.6	6010.74	7776.54	11351.88	11824.98	13649.22	16746.06	16239.18	14487.6	13155.6	12415.14	8889.06	22638.54	21670.56	16088.52
Potential VAT	137967.2	155251.6	172728.8	184776.2	188205.16	211528.48	261683.46	294588.12	362455.02	444230.78	547133.94	671820.82	613607.4	652343.4	684688.74	777713.12	799980.62	838741.14	832580.78

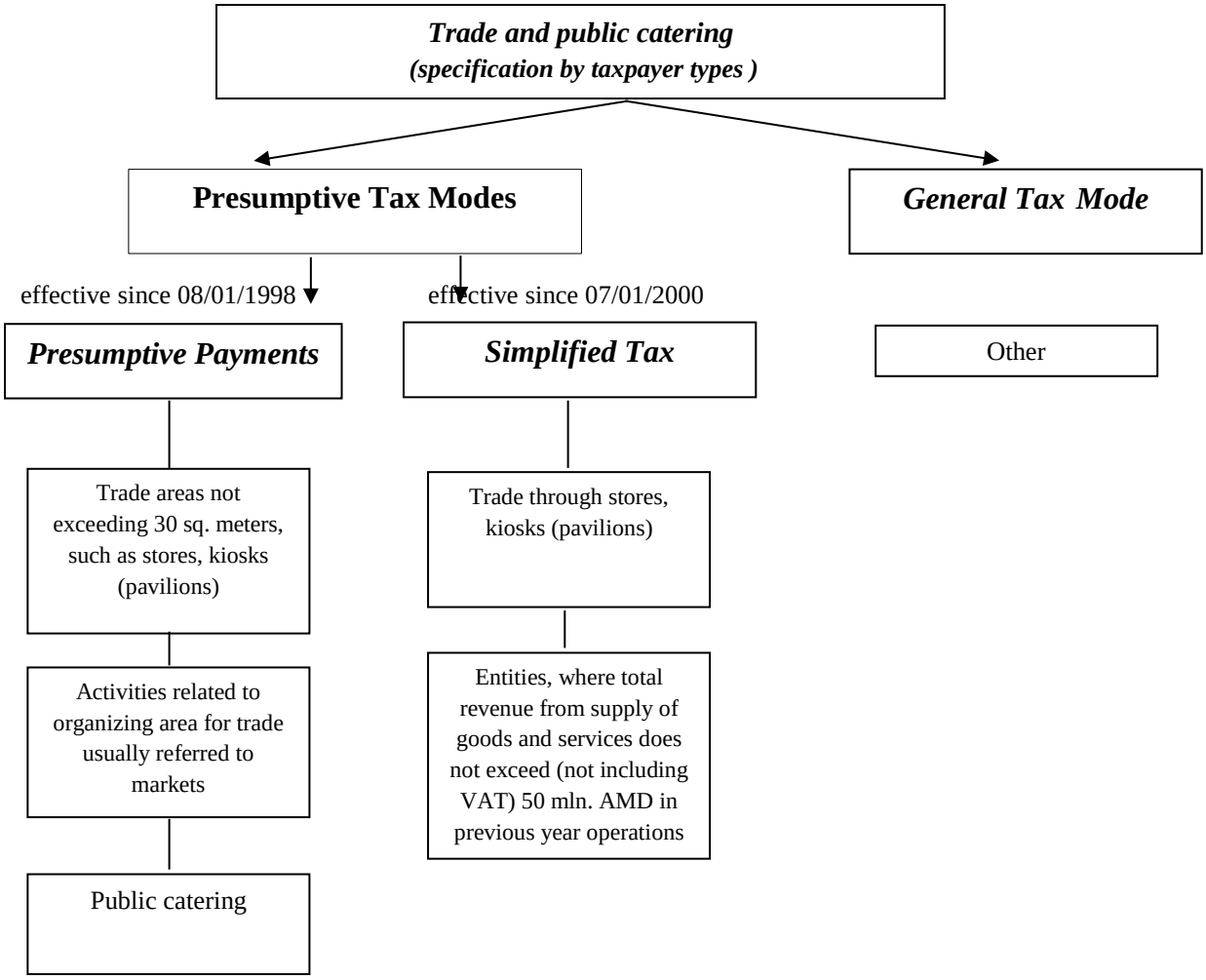
***Notes:*
VAT rate applied to value added produced in sectors of manufacturing, service provision and net import is 20%
The recounting rate of VAT in alternative taxes is 60%

Table 5. Selective measurements for tax collection performance



[13] Tax effort index and taxable capacity are estimated based on the methodology described in the Section 3.1 of this paper, which offers a new approach for potential tax revenue estimation

Figure 1. Specifics of taxation in the sector of trade and public catering[14]



[14] Sources: Ministry of Finance of Republic of Republic of Armenia. The RA Laws "On presumptive payments", "On simplified tax", "On the value added tax" all three are legislations of Republic of Armenia associated with the specifics of taxation in the sector of trade and public catering.

Table 6. VAT tax effort index OLS regression results

Source	SS	df	MS	Number of obs	=	19
				F(3, 15)	=	54.50
Model	.061944695	3	.020648232	Prob > F	=	0.0000
Residual	.005682706	15	.000378847	R-squared	=	0.9160
				Adj R-squared	=	0.8992
Total	.067627401	18	.003757078	Root MSE	=	.01946

Taxeffortindex	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
CollectedVATinGDP	.0441436	.0036392	12.13	0.000	.0363868	.0519004
SimplifiedTaxinGDP	.0991458	.0301199	3.29	0.005	.0349467	.1633449
PresumptivePaymentsinGDP	-.0272445	.0223056	-1.22	0.241	-.0747878	.0202988
_cons	.0991428	.028608	3.47	0.003	.0381663	.1601193

Table 7. VAT taxable capacity OLS regression results

Source	SS	df	MS	Number of obs	=	19
				F(3, 15)	=	8.58
Model	15.587974	3	5.19599133	Prob > F	=	0.0015
Residual	9.07878566	15	.605252377	R-squared	=	0.6319
				Adj R-squared	=	0.5583
Total	24.6667596	18	1.37037554	Root MSE	=	.77798

Taxablecapacity	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
CollectedVATinGDP	.5500988	.1454597	3.78	0.002	.2400588	.8601387
SimplifiedTaxinGDP	-3.996732	1.203899	-3.32	0.005	-6.562783	-1.430681
PresumptivePaymentsinGDP	.993104	.8915599	1.11	0.283	-.907211	2.893419
_cons	13.32014	1.143468	11.65	0.000	10.8829	15.75739

Table 7a. Effect of studied variables on VAT effort (ratio of collected VAT-to GDP)

Source	SS	df	MS	Number of obs	=	19
				F(4, 14)	=	4631.93
Model	28.7837626	4	7.19594064	Prob > F	=	0.0000
Residual	.021749702	14	.00155355	R-squared	=	0.9992
				Adj R-squared	=	0.9990
Total	28.8055123	18	1.60030624	Root MSE	=	.03942

CollectedVATinGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
SimplifiedTaxinGDP	.0091658	.0803028	0.11	0.911	-.1630667	.1813982
PresumptivePaymentsinGDP	.0431453	.0470711	0.92	0.375	-.0578123	.1441029
Taxeffortindex	17.27001	.1780144	97.01	0.000	16.8882	17.65181
Taxablecapacity	.4306128	.0104764	41.10	0.000	.4081432	.4530824
_cons	-7.442558	.1635202	-45.51	0.000	-7.793274	-7.091842

Table 8. Augmented Dickey-Fuller (ADF) test results

	level	1st difference	1% crit. value	5% crit. value	10% crit. value
Collected VAT to GDP	-2.341	-4.427	-3.750	-3.000	-2.630
Collected Simplified Tax to GDP	-1.738	-3.265	-3.750	-3.000	-2.630
Collected Pres. Payments to GDP	-1.911	-4.468	-3.750	-3.000	-2.630
VAT effort index	-3.009	-5.75	-3.750	-3.000	-2.630
VAT taxable Capacity	-1.53	-3.513	-3.750	-3.000	-2.630

Table 9. Eigenvalue stability condition

```
. varstable, graph

   Eigenvalue stability condition

+-------------------------------------+-----------+
|              Eigenvalue             |  Modulus  |
|-------------------------------------+-----------|
|  -.6606451                          |   .660645 |
|  -.0846532 +  .3871222i             |    .39627 |
|  -.0846532 -  .3871222i             |    .39627 |
|    .353573                          |   .353573 |
|   .2999244                          |   .299924 |
+-------------------------------------+-----------+

   All the eigenvalues lie inside the unit circle.
   VAR satisfies stability condition.
```

Table 10. Lagrange-multiplier test (LM test)

```
. varlmar, mlag(12)

   Lagrange-multiplier test

+-------+--------------+----+-------------+
|  lag  |        chi2  | df |  Prob > chi2|
|-------+--------------+----+-------------|
|    1  |     26.7916  | 25 |     0.36637 |
|    2  |     34.9175  | 25 |     0.08971 |
|    3  |     30.3532  | 25 |     0.21134 |
|    4  |     32.5215  | 25 |     0.14347 |
|    5  |     21.2691  | 25 |     0.67751 |
|    6  |     30.3061  | 25 |     0.21303 |
|    7  |     16.4729  | 25 |     0.90002 |
|    8  |     28.5239  | 25 |     0.28431 |
|    9  |     21.4926  | 25 |     0.66485 |
|   10  |     16.5541  | 25 |     0.89733 |
|   11  |     20.7747  | 25 |     0.70510 |
|   12  |     20.6035  | 25 |     0.71450 |
+-------+--------------+----+-------------+

   H0: no autocorrelation at lag order
```

Table 11. Granger causality test

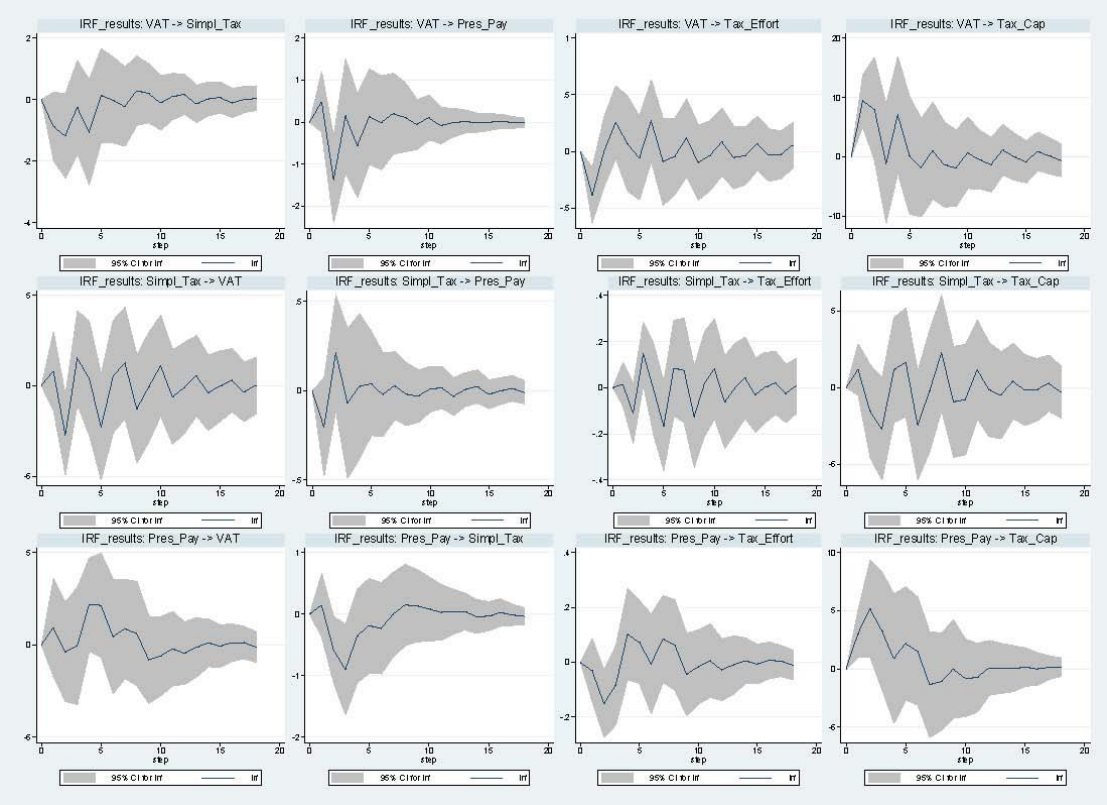
Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
VAT	Simpl_Tax	6.0136	2	0.049
VAT	Pres_Pay	2.3239	2	0.313
VAT	Tax_Effort	1.4326	2	0.489
VAT	Tax_Cap	2.1612	2	0.339
VAT	ALL	25.856	8	0.001
Simpl_Tax	VAT	7.1979	2	0.027
Simpl_Tax	Pres_Pay	1.9927	2	0.369
Simpl_Tax	Tax_Effort	7.1592	2	0.028
Simpl_Tax	Tax_Cap	6.084	2	0.048
Simpl_Tax	ALL	28.078	8	0.000
Pres_Pay	VAT	33.283	2	0.000
Pres_Pay	Simpl_Tax	5.6774	2	0.059
Pres_Pay	Tax_Effort	31.43	2	0.000
Pres_Pay	Tax_Cap	32.596	2	0.000
Pres_Pay	ALL	57.413	8	0.000
Tax_Effort	VAT	9.791	2	0.007
Tax_Effort	Simpl_Tax	3.4587	2	0.177
Tax_Effort	Pres_Pay	3.2472	2	0.197
Tax_Effort	Tax_Cap	9.5183	2	0.009
Tax_Effort	ALL	32.219	8	0.000
Tax_Cap	VAT	20.204	2	0.000
Tax_Cap	Simpl_Tax	9.6071	2	0.008
Tax_Cap	Pres_Pay	8.8259	2	0.012
Tax_Cap	Tax_Effort	18.917	2	0.000
Tax_Cap	ALL	107.89	8	0.000

Granger causality test results consistent with bi-directional causality hypothesis

VAT	Simplified Tax
Simplified Tax	Taxable Capacity
Presumptive Payments	Taxable Capacity
Tax effort index	Taxable Capacity

Table 12. Impulse-Response Function (IRF) test



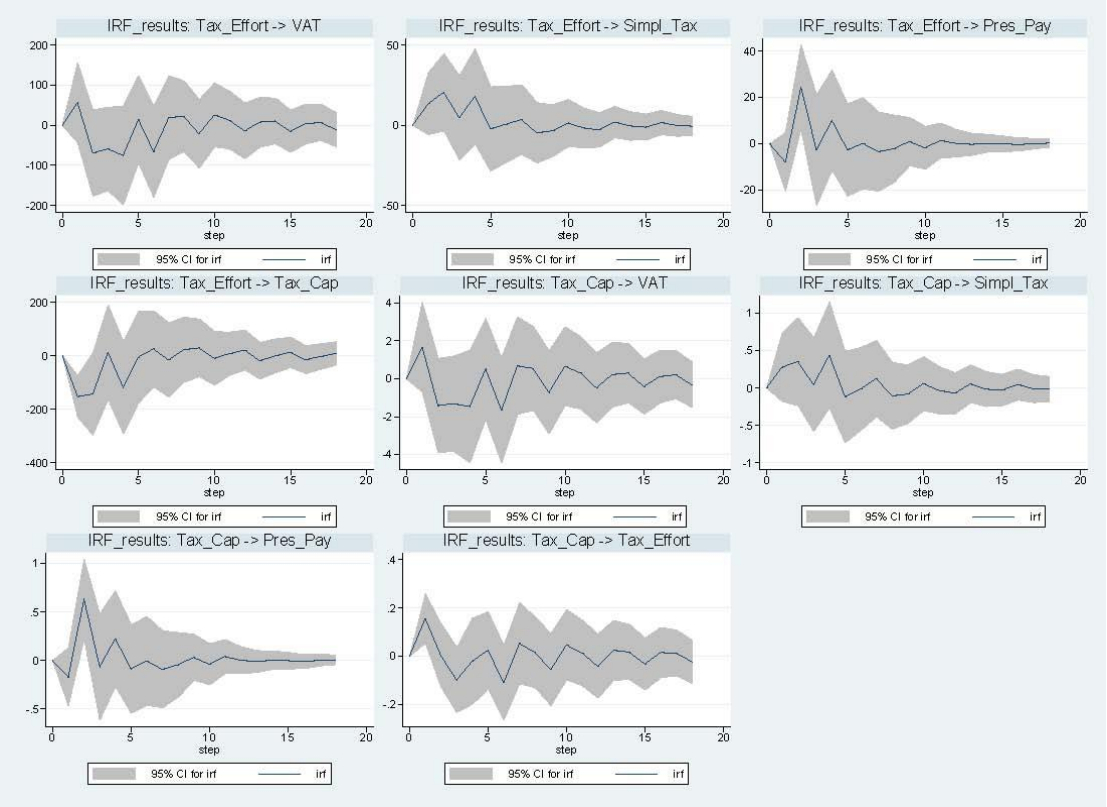


Table 13. Forecast Error Variance Decomposition (FEVD) test